lawyer. He studied at Paris, where he eventually graduated as Doctor of Sciences. His earliest researches were mainly geological, relating to such subjects as the dolomitisation of limestone and the origin of flint; but in 1851 he wrote about the skeleton of some star-fishes, and his attainments were so varied that he attracted the notice of the French Minister of Agriculture and Commerce, who sent him in 1853 on a scientific mission to Syria, Egypt, Greece, and the Ionian Islands. Gaudry's official report appeared as a publication of the French Government in 1855, dealing with the geology, natural products, industries, and possible commercial development of the several countries visited; but his observations on the geology of Cyprus were so exhaustive that he reserved most of the details for a special memoir, which was issued seven years later by the Geological Society of France. When Cyprus became a British possession in 1878, Gaudry's important work was translated into English and re-published by the Intelligence Department of the War Office.

While travelling in Greece, Gaudry's attention was directed to a remarkable accumulation of fossil bones at Pikermi, between Athens and Marathon, which had been discovered and partially examined by the Bavarians. Collections of the bones had been sent to Munich, and described by Roth and Wagner in the *Abhandlungen* of the Bavarian Academy; but Gaudry realised that more exhaustive exploration would yield important results, and he induced the French Academy to provide him with means for the work in the season 1855–6. He made a large collection, which was sent to Paris and occupied his attention for the next four years; in 1860 he returned to Pikermi to obtain additional specimens that seemed to be required; and between the years 1862–7 he published his classic monograph, "Animaux fossiles et Géologie de l'Attique." This work dealt chiefly with the Upper Miocene (or Lower Pliocene) Mammalia, and was the first systematic attempt to arrange extinct animals of successive geological periods in linear series below their surviving representatives, to illustrate the probable direction of evolution of the several groups. Gaudry showed clearly that the mammals of Pikermi were links between those of earlier date and those of the present day; and he initiated a plan of detailed comparison, especially of the teeth and feet, which has been followed with great success during later years by those who have investigated the numerous extinct mammalian faunas of North America. He recognised that much additional information on the same subject could be obtained by comparing the Upper Miocene (or Lower Pliocene) mammalian skeletons from France itself with those of earlier geological periods already known from that country. In 1866 he accordingly made explorations at Mont Léberon, in Vaucluse, and seven years afterwards his earlier volumes were supplemented by that on the "Animaux fossiles du Mont Léberon."

Meantime Gaudry had joined the staff of the Paris Museum of Natural History, first as assistant (1853) and subsequently as professor of palæontology (1872). Here he came into contact with many workers, and took part in several other researches while his own special studies were in progress. He was particularly interested in Boucher de Perthes's discovery of flint implements with the bones of extinct Pleistocene mammals in the river-gravels of Abbeville; and when Prestwich and others confirmed this discovery in a communication to the Royal Society in 1859, Gaudry added his testimony in a paper read before the French Academy at the same time. The problems connected with early man continued to interest him to the end, and so recently as 1903 he wrote for *L'Anthropologie* an essay on the dentition and lower jaw of human skeletons from the Mentone caves, demonstrating their very primitive characters.

Gaudry's researches on the fossil mammals of Pikermi and Mont Léberon naturally led him to apply his methods of study to other groups; and he planned a great work which should sketch at least the broad outlines of the evolution of life as revealed by palæontology. It was entitled "Les Enchaînements du Monde animal dans les Temps géologiques," and appeared in three volumes between 1878 and 1890, with a supplementary volume, "Essai de Paléontologie philosophique," in 1896. This work is unique as a readable exposition of the science of palæontology, and its beautiful wood-cut illustrations of fossils have never been surpassed. While it was in course of preparation a continual series of original papers recorded the more technical results of the author's researches.

For fifty years Gaudry devoted unbounded energy to the perfection and arrangement of the collection of fossils at the Paris Museum, and when he retired in 1903 his colleagues and friends of every nationality subscribed towards a suitable tribute of admiration. A medal was struck in honour of the occasion. His withdrawal from official duties, however, did not affect his original researches, and until the beginning of his last illness in the summer of this year he was regularly occupied with the study of the remarkable extinct mammals of South America. He arrived independently at the conclusion, which is now very generally adopted, that the mammals of the southern continent evolved separately from those of the northern hemisphere, and remained in a comparatively backward condition.

The whole of Gaudry's published work is characterised by an almost poetic mode of expression; and while detailed descriptions of the fossils are rarely omitted, they are often dispersed among his illuminating comparisons in such a manner that his writings have sometimes been criticised as unsystematic or superficial. Gaudry's extensive travels, however, had made him acquainted to an unusual degree with the fossils of every land, and he realised the limitations of his science too thoroughly to make the dogmatic assertions concerning genealogies and relationships which are not infrequent in the works of some of his followers. In the existing state of knowledge, he was satisfied with broad outlines which could be used for guidance in future more detailed research.

Gaudry became a member of the Institute of France in 1882, and a foreign member of the Royal Society in 1895. Among foreign honours there was none he appreciated more highly than that of the Wollaston medal, awarded to him by the Geological Society of London in 1884. An excellent portrait of him appears in the *Geological Magazine* for February, 1903.

A. S. W.

NOTES.

DR. F. WALKER MOTT, F.R.S., has been elected Fullerian professor of physiology in the Royal Institution.

THE next meeting of the Australasian Association for the Advancement of Science is to be held in Brisbane in January, 1909.

THE annual meeting of the British Science Guild will be held on Friday, January 22, at the Mansion House, by permission of the Lord Mayor. Mr. Haldane, president of the Guild, will be one of the speakers.

IT is announced from Stockholm that the Nobel prize for physics has been awarded to Prof. G. Lippmann, and not to Prof. Planck, as was stated last week. Prof. Lippmann left Paris for Stockholm on December 4.

The recently created Royal Society of South Africa has elected Sir David Gill, K.C.B., F.R.S., its first honorary fellow of the society, "in recognition of his great scientific attainments and of the great help and impetus he has given to scientific research in South Africa."

Dr. W. E. Hoyle, director of the Manchester Museum and lecturer on morphology of Mollusca in the University of Manchester, has been appointed director of the National Museum of Wales. Dr. Hoyle will commence his duties not later than March 25 of next year.

At the annual business meeting of the Scottish Meteorological Society, held at Edinburgh on December 1, Sir Arthur Mitchell, K.C.B., was elected president; Prof. A. Crum Brown, F.R.S., and Sir Archibald Buchan-Hepburn, of Smeaton-Hepburn, Bart., were elected vice-presidents.

Dr. C. E. Beevor, whose death occurred on December 5 at fifty-four years of age, was Croonian lecturer at the Royal College of Physicians in 1903, Lettsomian lecturer at the Medical Society of London in 1907, and also president of the Neurological Society in the same year. Among his publications were scientific papers on the nervous system.

The Bessemer gold medal of the Iron and Steel Institute has been awarded to M. A. Pourcel. The medal is awarded annually for services to metallurgy, and it is for M. Pourcel's investigations in the manufacture of ferro-manganese and for his work on the thermal reaction involved in the manufacture of iron and steel that he will receive it.

The meeting of the Royal Geographical Society on December 14 will be a commemoration meeting of the jubilee of Speke's discovery of the Victoria Nyanza. Sir William Garstin will give an address on fifty years of Nile exploration and some of its results, and there will be an exhibition of portraits, Speke's original map of his discoveries, instruments, photographs, and other objects.

Dr. Azel Ames, whose death is reported from Danvers, Massachusetts, at the age of sixty-three, was at one time prominent among American writers on hygiene. He served as a lieutenant of engineers in the Civil War and as a surgeon in the Spanish War. He had also held various posts under the U.S. Government, in which his knowledge of sanitary affairs was of value.

According to the Paris correspondent of the *Times*, an agreement has been signed between the authorities of the French Congo, the Pasteur Institute, and the Geographical Society, with the object of transforming the French mission for the study of sleeping sickness into a bacteriological institute at Brazzaville. The institute will be placed under the direction and control of the Pasteur Institute in order to ensure the permanence of the organisation.

The Paris correspondent of the *Times* announces that Mr. J. Gordon Bennett has offered the Aéro Club de France, as a new international prize, a cup of the value of 500*l.*, to be competed for next year in France under the auspices of the International Aëronautic Federation and of the French Society for the Encouragement of Aërial Locomotion. In addition, Mr. Gordon Bennett offers three sums of 1000*l.* each to be given to the winner of each of the first three annual competitions.

The death is announced of Prof. E. G. von Rindfleisch, the eminent pathologist, at seventy-two years of age. Prof. Rindfleisch occupied in succession the chairs of pathology at Zürich and Bonn, and in 1874 he succeeded to the chair of pathological anatomy in the University of Würzburg, which had been occupied by the late Prof. Virchow. He devoted considerable attention to the causes and treatment of tuberculosis, and his publications included a manual of the doctrine of cellular pathology, a volume on the elements of pathology, and papers on the principle of life and on medical philosophy.

Prof. Alfred Lodge desires to correct a part of the statement as to his remarks at the recent meeting on the correlation of the teaching of mathematics and science, reported in Nature of December 3 (p. 144). What he suggested was that the science masters should each term furnish the mathematical masters with an epitome of the mathematical knowledge required by each division to enable the pupils to follow satisfactorily the science course of the following term, in much the same way as a mathematical preamble to each chapter or group of chapters of a scientific book would facilitate the understanding of these chapters.

Mr. Alfred Colson, Millstone Lane, Leicester, who was one of the local secretaries for the meeting of the British Association held there in 1907, is preparing an album of extracts, reports, photographs, &c., for presentation to the library of the local Literary and Philosophical Society. He is anxious to obtain as many snapshots as possible of the visitors, and would be glad if photographers would send him negatives (which would be returned safely) or prints to illustrate the album. Photographs taken at the Loggia, the garden-party at Glenfield Frith, the Abbey Park, in the reception room, or at any of the excursions would be particularly acceptable. No doubt many photographers who were present at Leicester will assist Mr. Colson to secure this memento of a successful meeting.

In the issue of Nature for June 11, 1903 (vol. lxviii., p. 129) an article on Mr. W. A. Bentley's photographs of snow crystals was published, in which reproductions were included of some of his photomicrographs, taken from the annual summary for 1902 of the *Monthly Weather Review*. The annual summary for 1907 of the *Review* (vol. xxxv., No. 13), which has reached us, contains another admirable collection of photomicrographs of frost and ice crystals. There are thirty-one plates, which have upon them some 274 separate photographs. The plates are unaccompanied by any letterpress, but a description of the photomicrographs will probably be published later.

A series of fire-tests of importance for the extinction of petrol fires with the aid of such simple means as cloths and sand was carried out by the British Fire Prevention Committee on December 2. Some twenty-four tests were undertaken at the committee's Regent's Park testing station. There was a large attendance of Home Office officials, as also officers from the Admiralty, War Office, London County Council, and other public departments. The tests were of a highly instructive character, and went to prove the efficiency of simple means for extinguishing petrol fires. An official illustrated report will be issued by the British Fire Prevention Committee in due course.

Mr. A. Silva White, assistant secretary of the British Association, has resigned that office, which he has held with conspicuous success during the past four years. The announcement of his resignation will be received with regret by the sectional officers, who, perhaps more than members of the council, are able to appreciate the results of his organisation of the work of the association during his period of office. The establishment of a Press Bureau is a particular instance of the advantages of combining in an organic system what had previously been left to individual action. At the meeting of the council on Friday last, the cordial thanks of the association were expressed for Mr. White's work, but it was resolved that the assistant secretary should not be a member of the council; and as this was the chief condition under which he would continue in office, his resignation was accepted.

MR. G. C. LLOYD has been appointed secretary of the Iron and Steel Institute in succession to the late Mr. Bennett H. Brough. Since 1904 Mr. Lloyd has been secretary of the Institution of Electrical Engineers, and he was previously assistant to Mr. Brough at the Iron and Steel Institute. We are glad to see that the council of the institute has decided to raise a fund to provide for the education of Mr. Brough's two children, and to give his widow a life annuity. A sum of about 5500*l.* is required; and it is a fine testimony to the high regard in which Mr. Brough's memory is held to know that subscriptions amounting to 2635*l.* were promised by members of the council before the appeal was issued to members of the institute by Sir Hugh Bell, the president. We are confident that the appeal will be responded to generously, not only by members of the institute, but also by numerous other admirers of Mr. Brough's work for pure and applied science. Subscriptions should be sent to the president, Iron and Steel Institute, 28 Victoria Street, London, S.W.

THE director of the Wistar Institute of Anatomy and Biology, Philadelphia, U.S.A., informs us that the anatomical journals published by the institute are to be sent regularly to NATURE. We shall be glad to notice from time to time any articles of outstanding importance and wide interest in these publications. The Wistar Institute, the only institution of its kind in the United States, is an endowed institution, maintaining a free museum of anatomy and a staff for the promotion of researches in this subject. It is rapidly becoming the central anatomical institute for research work in the United States, and its publications are distributed to all the principal laboratories of the world. As a central institute of anatomy it attempts to bring together data, specimens, and literature, and to interchange and distribute them to investigators in such a manner as to promote anatomy and aid those who are devoting their lives to the advancement of human knowledge. To the technical aspects of anatomy NATURE cannot devote much space, but an occasional note upon American progress in that science will be of interest to all biologists.

THE following are among the lecture arrangements at the Royal Institution before Easter:—Prof. W. Stirling, a Christmas course of six experimentally illustrated lectures on "The Wheel of Life," adapted to a juvenile auditory; Prof. Karl Pearson, two lectures on albinism in man; Prof. A. A. Macdonell, three lectures on the architectural and sculptural antiquities of India; Dr. F. Walker Mott, six lectures on the evolution of the brain as an organ of mind; Prof. J. O. Arnold, two lectures on mysteries of metals; Dr. Hans Gadow, three lectures on problems of geographical distribution in Mexico; Mr. A. D. Hall, two lectures on recent advances in agricultural science; Prof. G. H. Bryan, two lectures on aërial flight in theory and practice; and Sir J. J. Thomson, six lectures on properties of matter. The Friday evening meetings will commence on January 22, when Dr. Alfred Russel Wallace will deliver a discourse on the world of life: as visualised and interpreted by Darwinism. Succeeding discourses will probably be given by Sir Frederic Nathan, Prof. J. G. Frazer, Prof. H. A. Wilson, Sir Henry Cunynghame, the Earl of Berkeley, Mr. S. G. Brown, Mr. R. Threlfall, Mr. A. S. Eddington, and Sir J. J. Thomson.

TO-MORROW (December 11) a new wireless telegraphy station is to be opened at Bolt Head, near Kingsbridge, South Devon. The Postmaster-General is expected to be present. The station is about fifteen miles south-east of Plymouth, the Start being seven miles to the eastward, and Prawle Point, where Lloyd's station is fixed, between four and five miles. Bolt Head stands 350 feet above the sea-level, which is considerably higher than the Marconi station in Cornwall. The work was begun about six months ago, and is estimated to cost about 10,000*l.* We learn from the *Times* that an eight horse-power oil engine with dynamo and electrical appliances has been put down. The power is 110 volts, and there is large storage capacity for night work. The radio-telegraphic instruments are a combination of the Marconi and patents owned by the G.P.O., and one or two of Mr. Marconi's staff have assisted in laying down the plant. If the experiment is found satisfactory it is anticipated that the Government will provide other stations. It is stated that the station at Bolt Head will be open for public messages during the first week in January.

THE German Government has decided to send an expedition to the southern part of German East Africa to examine, and make a careful collection from, the remarkable deposit of Dinosaurian bones discovered last year by Prof. Eberhard Fraas in the Upper Cretaceous formation of Tendaguru, in the Lindi district. According to the report of Prof. Fraas, published last August (*Palaeontographica*, vol. lv., pp. 105–144, pls. viii.–xii.), the deposit resembles that of the famous Bone Cabin Quarry in Wyoming, from which the Americans have obtained so many remarkable gigantic reptiles. The huge bones lie weathered out on the surface of the ground, and can be followed by digging into the sandy marl and sandstone beneath them. Many of the bones are in their natural relative positions, showing that at least some parts of the skeletons were buried before their surrounding soft parts had decayed; and Prof. Fraas publishes a striking photograph of a nearly complete hind limb and foot before removal from the excavation in which it lay. All the specimens brought back by Prof. Fraas for the Royal Württemberg Museum in Stuttgart, where they are now mounted, belong to a large herbivorous Dinosaur which he names Gigantosaurus. They appear to represent an animal from 14 to 15 metres in length, closely related to the well-known Diplodocus and Morosaurus from Wyoming. The skull remains unknown, but both vertebræ and limbs are represented by numerous specimens. Further explorations will probably result in the discovery, not only of the missing parts of Gigantosaurus, but also of other reptiles which must have lived with it.

IN the death of Dr. E. T. Hamy, professor at the Muséum d'Histoire naturelle (1892), member of the Académie des Inscriptions et Belles-lettres (1890) and of the Académie de Médicine (1903), anthropologists have lost a learned colleague and France an illustrious savant. Jules Théodore Ernest Hamy was born at Boulogne-sur-Mer in 1842, and was always profoundly attached to his native district, as is testified by the eleven memoirs on its archæology published in the *Mémoirs de la Société academique de Boulogne-sur-Mer*, in the *Bulletin de la Société d'Anthropologie de Paris*, and in the *Revue d'Anthropologie*. He published his valuable pioneer work, the "Précis de Paléontologie humaine," in 1870. In 1873 he was appointed "aide naturaliste" to De Quatrefages, then professor of anthropology at the museum, and in collaboration with him published the classical work "Crania ethnica" (1875–1882); of equal value is his great "Anthropologie du Mexique" (1884, 1890, 1891). His interest in American archæology and ethnography is evidenced by the "Decades Americanæ" (1883–1899). In 1880 he was appointed director of the Musée d'Ethnographie, then recently installed in the Trocadéro, which post he held for twenty-six years; but despite his incessant efforts, lack of funds prevented him from developing it according to his desires. In this connection he published the "Origines du Musée d'Ethnographie" (1890) and the "Galerie americane du Musée d'Ethnographie du Trocadéro" (1897). The geographical aspects of ethnology had an attraction for him, his most important contribution being the "Études historiques et géographiques" (1896). Most of his ethnographical essays were published in the *Revue d'Ethnographie et Anthropologie* (1882–9). Dr. Hamy possessed a great range of knowledge and sane judgment, and it is not only in France that his loss will be felt.

ALTHOUGH there is a slight increase in the list over that of the previous year, the council of the Ealing Scientific and Microscopical Society, in its report for 1907–8, urges the necessity for new members. Abstracts of the lectures delivered last session are included in the report.

FOUR out of the five papers in vol. ii., No. 3, of the Journal of the Federated Malay States Museums are devoted to the mammals of the district, Mr. O. Thomas describing new species from Tioman and Aor Islands, in the South China Sea, while Mr. Boden Kloss contributes lists of the species inhabiting the Malay Peninsula and neighbouring areas. It is sad to see such well-known names as *Macacus cynomolgus* and Galeopithecus respectively replaced by *Macaca fascicularis* and Galeopterus.

THE ovum of mammals forms the subject of two papers (each issued only in preliminary shape) in No. 6 of the Bulletin of the Royal Academy of Belgium. In the first of these Messrs. Winiwarter and Sainmont announce the discovery that, in the cat at any rate, the functional ova are developed during post-fœtal life, whereas it has hitherto been supposed that in all mammals this took place *in utero*, or during the very earliest stages of extra-uterine development. The second paper, by Dr. O. Vander Stricht, is devoted to the development of the ovum in bats, as represented by the noctule.

THE whole of the second number of the Annals of the Transvaal Museum is devoted to an account of the numerous species of ticks infesting South Africa. According to the author, Mr. C. W. Howard, entomologist to the Mozambique Government, these pests have hitherto been studied only in relation to the transmission of disease, so that little has been known with regard to specific characteristics and the variations (which are great) presented by the different species. These gaps in our knowledge are to a great extent filled by Mr. Howard's paper, although, as might be expected, much work still remains to be done.

FOR some time a discussion has been going on in the columns of the *Emu* with regard to the food of Australian cormorants and the harm these birds are alleged to inflict on the local fisheries. The discussion is continued in the October number of that journal, where it is emphatically affirmed that, instead of subsisting exclusively on fish (as is universally stated to be the case with all cormorants), these birds feed very largely upon crabs and shrimps, which themselves are harmful to fisheries on account of their partiality to fish-spawn. Moreover, instead of subsisting very largely on the introduced trout, as has been alleged, the local cormorants are stated to be much more fond of eels, which are of little importance as food-fish.

IN a notice of the badger in Norfolk, published in the November number of the *Zoologist*, Mr. A. H. Patterson gives a qualified assent to a theory suggested by Mr. T. Southwell, that the aboriginal stock was at one time totally exterminated, and the existing representatives of the species are the descendants of animals turned down in consequence of their usefulness in forming earths for foxes. If this be so, the practice of huntsmen in regard to badgers in Norfolk is different from that obtaining in certain other counties we could mention. It is satisfactory to learn that Norfolk badgers are now on the increase.

WE have been favoured by the author, Mr. R. B. Newton, with copies of two papers from the Proceedings of the Malacological Society, one on relics of coloration in fossil shells, and the other on fossil pearl-growths. The former is illustrated with a plate showing colour-pattern on shells from the Silurian upwards. The author mentions the theory that such patterns may be taken to indicate the comparatively shallow-water habitat of the shells in which it occurs, and the objections taken to the same, but fails to give his own opinion on the matter. Pearls or pearl-like growths are shown in the second paper to occur in fossil shells of the genera Volsella (Mytilidæ), Inoceramus (Aviculidæ), and Gryphæa (Ostræidæ), most of these being of Cretaceous age.

NEW discoveries of fossil fishes and arthropods in the Middle Coal-measures of Sparth, Rochdale, Lancashire, form the subject of a paper by Mr. W. A. Parker in vol. ix. of the Transactions of the Rochdale Literary and Philosophical Society. The fish-remains include scales of species of Ctenodus and *Strepsodus sauroides*, as well as a nodule enclosing a nearly entire specimen of a probably new member of the palæoniscid group. Of greater interest are the arthropod fossils, which include eight new species, namely, two of Eoscorpius, three members of the king-crab group referable to the genus Belinurus, a pedipalpate arachnid of the genus Geralinura, a member of the shrimp-like Pygocephalus, notable as being the only specimen exhibiting the whole dorsal surface, and a myriapod referable to Xylobius. Examples of previously known arthropods are likewise recorded.

AN issue (vol. iii., No. 4) of the botanical series of the *Philippine Journal of Science* is devoted to two sets of identifications of insular plants. The majority of the specimens described by Mr. C. B. Robinson, under the title "Alabastra Philippinensia, II.," are shrubs or trees collected by Mr. R. S. Williams. The euphorbiaceous genus Cleistanthus, supplying several new species, is specially summarised. The second paper, contributed by Mr. E. D. Merrill, contains the diagnoses of many new species and a new genus, Sagittipetalum, of the order Rhizophoraceæ, that grows in the dipterocarp forest. The species of Homalium, a genus furnishing important trees, are differentiated with the help of a key.

BULLETINS dealing with ground-nut and fig cultivation in southern India have been published by the Department of Agriculture, Madras. The notes by Mr. H. C. Sampson on ground-nut cultivation refer to the "Mauritius" variety, that has replaced the native or "country" variety. In some districts quick-growing millets are planted as a catch-crop. Mr. C. K. Subba Rao is responsible for the pamphlet on fig cultivation. The red, loamy soil and temperate climate of Bangalore and Bellary provide conditions suitable for the fig tree. Artificial pollination, known as "caprification," is not practised, nor are the figs dried for market, owing, presumably, to the ready sale that exists for the fresh fruit

THE results of two years' experiments obtained on various estates and at the sugar experiment station, Jamaica, are reviewed by Mr. H. H. Cousins in his report recently published by the Board of Agriculture. A fact of considerable interest is the value of small dressings of lime on the sugar plantations. In accord with manurial experiments elsewhere, the application of a manure rich in nitrogenous matter is essential and profitable. With regard to new seedlings of value, the well-known variety B. 208 has proved to be eminently satisfactory for all districts, but even better results are expected from seedlings raised on the island within the last five years.

FROM Prof. Haberlandt's laboratory at Graz there has been issued another paper on the perception of light by plants, that is published in the *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, Vienna (vol. cxvii., part ii.). The author, Dr. K. Gaulhofer, has studied the epidermal cells of the leaves of certain plants that take up a fixed light position, and suggests that an explanation may be found in the presence of pits or clefts in the cell walls acting as light distributors, in a similar manner to Prof. Haberlandt's "lichtsinnesorgane." The rays of light impinging on the edges of the pits are deflected, and consequently, underneath the pits, shadows are produced. Good instances of such pits occur in *Aporrhiza paniculata* and *Banisteria splendens*, while *Hyperbaena laurifolia* and *Abuta concolor* show well-marked clefts. The combination of pits and curved cell wall in *Cocculus laurifolius* will repay examination.

THE increasing use of artificial manures in South Australia—a sure sign of advance in agricultural methods—forms the subject of an interesting article in a recent issue of the *Journal of Agriculture of South Australia*. During the last ten years the total acreage under cereals has remained fairly constant, but the proportion receiving artificial manures has increased from 12 per cent. in 1898 to 68 per cent. during the present year. The steady and continuous nature of the increase is seen in the following table:—

	Total area under cereals, acres	Area receiving artificial manures, acres
1898	2,148,000	230,000
1900	2,298,000	500,000
1902	2,144,000	845,000
1904	2,154,000	1,170,000
1906	2,063,000	1,321,000
1908	2,154,000	1,456,000

Superphosphate is by far the commonest artificial manure used; at present it is imported, but as large quantities of mineral phosphates are known to occur in South Australia, there seems no reason why it should not be made on the spot.

MR. H. LING ROTH, honorary curator of the Bankfield Museum, Halifax, issues as one of his periodical Bulletins an interesting study of "Trading in Early Days." He suggests that the most primitive form of trading is to be found in the exchange of presents among certain members of savage tribes. He discusses the questions connected with silent trade, secret bargaining, early forms of transport and markets, the evolution of notation and currency, all illustrated by excellent photographs from the collections under his charge.

THE University of Philadelphia has undertaken a series of excavations in the Isthmus of Hierapetra, in Crete, the results of which for the year 1906, and so far as the site of Vasiliki is concerned, are described in the second volume of the Transactions by Mr. R. H. Seager. The remains extend over the second and third stages of the early and the first of the Middle Minoan periods. Though the ground has suffered much from denudation, some valuable discoveries have been made—a beehive tomb at Hagios Theodoros, believed to be the second of its kind belonging to the Bronze age that has been found in Crete; a series of houses, and much fine pottery. In connection with this last Mr. Seager makes the interesting statement that the mottled ware of the third Minoan period is of a type commonly in use at the present day in south India from Tuticorin to Madras, while that of the fourth period strikingly resembles the modern domestic ware of the Rajput States. The writer, in agreement with Profs. Ridgeway, Bosanquet, and others, regards as an early form of currency a number of curious axes, these weapons being obviously too small and weak to serve any industrial or military purpose.

DR. J. M. PERNTER has sent us the year-book of the Austrian Central Meteorological Office for 1906. The number of stations then included in the system was 409, of which forty-two ranked as observatories or stations of the first class, *e.g.* possessing self-recording instruments. The observations are arranged according to the class of station; some include hourly values, while at others tri-daily observations or simply mean results are given; several organisations, including the Hungarian, publish their observations separately. The Central Office takes part in the international monthly balloon ascents for the investigation of the upper air, and also issues weekly reports of earthquake phenomena observed at several of the principal observatories. An appendix contains valuable discussions (1) of thunderstorms and hail in Bohemia in 1905 and 1906, by Dr. F. Augustin, and (2) measurements of solar radiation at Vienna from March, 1904, to September, 1906, with Ångström's compensation pyrheliometer. The results are exhibited both statistically and graphically by Dr. R. Schneider, and show, *inter alia*, that the solar intensity on a perpendicular surface of 1 cm^2. attains its maximum of 740 gram calories *per diem* at the beginning of June, and its minimum of 245 calories *per diem* in December.

THOSE who have the designing of glass gauges and other glass apparatus to withstand high pressures will find a number of useful tables of breaking stresses of tubes subjected to internal pressure and of filaments subjected to tension in Communication No. 106 from the Physical Laboratory of Leyden, by Prof. Kamerlingh Onnes and Dr. Braak. Although the numbers in the tables differ considerably from each other in many cases, it seems that tubes break when the pressure inside makes the maximum tension in a direction perpendicular to the axis equal to about 5 kilograms per square millimetre, and that filaments in tension break at about 17 kilograms per square millimetre at ordinary temperatures, and at about 30 kilograms at the temperature of liquid air.

IN X-ray work it is necessary that the current through the tube shall be unidirectional. There are devices in existence by means of which the behaviour of the tube can be tested. There are also devices by means of which the unidirectional character can be brought about, but these devices usually impair the performance of the tube. We have had the opportunity of examining an arrangement recently brought out by Messrs. F. R. Butt and Co., of 11 Denmark Street, W.C. The usual primary of the induction coil is surrounded by a subsidiary coil consisting of a single layer. This second coil can be short-circuited at any time, and it is so connected with a revolving break that it is short-circuited just prior to the make of the primary. The induced E.M.F. at the secondary terminals is thereby so far diminished that no discharge occurs there at the make. The subsidiary coil is immediately afterwards interrupted by the revolving break (and for greatest efficiency this interruption must occur when the current in the primary coil has a stationary value); the discharge at break of the primary circuit then takes place without being in any way reduced by the presence of the subsidiary coil. The result is a unidirectional current as perfect as could be desired. There are other details of the coils turned out by this firm which are of interest. In particular, the iron core, consisting of iron wires, is laid with these wires arranged in groups, which are insulated from one another with the object of thoroughly preventing the formation of Foucault-current circuits in the iron.

A supplementary list of new apparatus for physical demonstrations, just issued by Messrs. Newton and Co., contains particulars of the nature and use of a number of important instruments. By arrangement with Mr. W. Duddell, F.R.S., Messrs. Newton are enabled to supply the complete apparatus for his well-known experiments with musical arcs. A universal optical bench and projection apparatus, designed by Mr. F. J. Cheshire, provide a means of demonstrating many important facts as to light and colour by projection. The same apparatus, with accessories, can be used to illustrate the optical properties of the human eye, and the principles of the telescope, microscope, and other optical instruments. Dr. R. S. Clay's apparatus for the production of waves and ripples in water and their projection upon a screen provides a particularly instructive means of illustrating interference effects. Lecture-table apparatus to demonstrate the properties of selenium and their application in the transmission of pictures by telegraphy is also described, together with other devices of interest to teachers and students of physics. The list should be seen by all who are contemplating the provision of new apparatus necessary for modern physical demonstration.

OUR ASTRONOMICAL COLUMN.

The Spectrum of Comet Morehouse, 1908*c*.—In No. 21 of the *Comptes rendus* (November 23, p. 951) MM. Deslandres and Bosler publish some very interesting results derived from spectrograms of comet 1908*c*, taken with a slit spectrograph of 0·12 m. (4·7 inches) focal length, and a ratio of aperture to focal length of about 1 : 3.

On spectrograms obtained previously with a prismatic camera, MM. Deslandres and Bernard found that certain lines of unknown origin in the spectrum of this comet, as, also, in that of comet Daniel photographed last year, were double, and it was partly to determine the reality and nature of this doubling that the slit spectrograph was employed.

Two spectra were obtained, and they show that double lines really do exist at the approximate mean wave-lengths 470·00, 456·10, 453·10, 426·7, and 401·3. Moreover, the intervals between the components vary, approximately, with the wave-length, so that the ratio $\Delta\lambda/\lambda$ is practically constant.

Another remarkable feature, noted in the case of those radiations produced by the tail, is that the lines show different inclinations to the length of the spectrum, and it is suggested that this may be due to the fact that the particles of matter emitting the respective radiations were being acted on differentially by the solar repulsion; if this is the true explanation of the phenomenon, we have an experimental proof of the truth of Bredichin's theory.

In the longest lines, extending well into the tail, there is also a marked inflexion at some distance from the head, and the authors suggest that this phenomenon may be due to rotation of the tail.

Previous researches with the prismatic camera gave MM. Deslandres and Bernard no indications of polarisation in the components of these doublets; it therefore seems probable that the doubling is not a Zeeman effect. From the fact that the intervals separating the components appear to bear a constant ratio to the wave-length, it would seem rather to be a Doppler effect, but the researches must be carried much further ere any conclusion can be definitely accepted.

The Changes in the Tail of Comet Morehouse.—From No. 12 of the *Gazette astronomique* (November 30, p. 93) we learn that the photographs of Morehouse's comet, taken at the Juvisy Observatory, confirm the peculiar phenomena of the tail observed at Greenwich, Stonyhurst, and other observatories. Not only do they show the ebb and flow of activity, probably caused by the comet encountering masses of meteoritic matter of different densities, but they also afford proof that the conspicuous agglomerations in the tail suffered an acceleration in velocity as they receded further and further from the head.

Determination of Longitude by Wireless Telegraphy.—The *Comptes rendus* for November 2 (p. 819) contains a report, by M. Bouquet de la Grye, on behalf of the wireless telegraphy committee of the Académie des Sciences, dealing with the subject of the determination of longitude at sea by the aid of wireless telegraphy.

After reviewing the immense importance to navigators of this question, and the various methods by which longitudes have hitherto been determined, the report discusses the possibility of sending signals, at pre-advertised hours, from the summit of the Eiffel Tower. It is concluded that such signals could be sent, say, at midnight, when there would be least interference, and that ships in any part of the Atlantic, for example, could thereby receive their correct time necessary for the determination of longitude. A recommendation that the necessary experimental apparatus be erected on the Eiffel Tower as soon as possible was elicited from the Bureau des Longitudes, endorsed by the committee, and forwarded to the Ministers of War and Marine.

Spectroscopic Binaries.—The November number of the *Astrophysical Journal* (vol. xxviii., No. 4) contains two papers by Mr. Plaskett, of the Dominion Observatory, Ottawa, dealing respectively with the orbits of the spectroscopic binaries ψ and ι Orionis.

For the former, the results show an abnormally large range of velocity, about 288 km., and a period of 2·52588 days; the apparent length of the semi-major axis of the orbit is 4,995,100 km.

The application of a least-squares solution to the data given previously for the orbit of ι Orionis has amended the orbit to some extent. The final elements give the ellipticity as 0·7543 ± 0·0046, the period as 29·136 days, and the apparent length of the semi-major axis as 28,907,000 km.

A Recent Observation of Nova Cygni.—From a plate exposed for two hours, Dr. Karl Bohlin estimates that Nova Cygni (No. 2), 1876, was of the fourteenth magnitude on October 22. From January 8, 1877, to March 24, 1882, the magnitude of this object sank from 6·7 to 14·0, and recent measures have given the following magnitudes:—Burnham, 1891·6, 13·5; Barnard, 1901·9, 15·6; Bohlin, 1908·8, 13·5. On the Dunecht scale of magnitudes Barnard's and Bohlin's results are between 15·0 and 14·3, and 14·0 respectively (*Astronomische Nachrichten*, No. 4286, p. 226, November 28).